

Value Production, Value Transfer and Accumulation: A Political Economics Analysis of Uneven Regional Development in China

Zhixuan Feng, Bangxi Li, Zhiming Long, Chen Zhang*

This paper aims to understand China's uneven regional development in recent years on the basis of on political economics theories. We summarize two theories from the political economics on uneven regional development—framework of production and framework of exchange—and unify them by theories of labor value and capital circulation. It means to show that uneven regional development will be explained with value production, value realization and capital accumulation, and their interactions as well. This framework can not only explain regional disparities in a static sense, but also presents dynamically developments of regional disparities—first rising and then falling. Empirical research finds China's regional disparities result mainly from the value production gap. During the period of analysis, China went through a capital accumulation biased towards less developed regions, jointly shaped by market logic and government behavior. It made the effect of reducing regional disparities stronger than the “polarization effect” around 2007, producing a narrowing of disparities across regional development.

Keywords: value production, value transfer, capital accumulation, uneven regional development

1. Introduction

China's regional disparities in development and income have shown complex dynamics since it started the socialist market economy system. Prior to the 21st century, a basic academic consensus was that regional income inequality was widening in China. After that, the trend slowed down and even reversed. Scholars may judge differently on specific turning points but generally get to a common view on the developments of rising first and then falling (Feng *et al.*, 2015; Hu *et al.*, 2015; Lu *et al.*, 2019). Studies on the interpretation of regional disparities in development and income are numerous, based mainly on the neoclassical economics framework, which offers many useful insights into regional disparities, though, its basic logic is that market economy will narrow income inequality across regions. Regional disparities

* Zhixuan Feng (email: fengzhixuan@nankai.edu.cn), Collaborative Innovation Center for China Economy, School of Economics, Nankai University; Bangxi Li (corresponding author, email: libangxi@tsinghua.edu.cn), Institute of Economics, School of Social Sciences, Tsinghua University; Zhiming Long (email: zhiminglong@tsinghua.edu.cn), School of Marxism, Tsinghua University; Chen Zhang (email: zhangchen2011@ruc.edu.cn), School of Economics, Renmin University of China.

result mainly from market imperfections and artificial distortions (Cai *et al.*, 2001; Lin and Liu, 2003; Lu *et al.*, 2019; Wang *et al.*, 2019). The framework overemphasizes the good part of market economy in regional development to avoid certain logic opposite, so the complexity and disparities of regional development under the market economy are overlooked.

Turning to political economics, one will find that the related literature is much richer in terms of regional disparities. Flows of capital and labor also result in the regional equalization of profits and wages, according to the fundamental principles of political economics. However, its analysis will not stop there. A number of studies have introduced capital accumulation, unequal exchange, land rent and monopoly into their analysis, and these factors contain strengths that assimilate and differentiate the regional development. Intensity changes and interactions of opposite strengths will collectively portray complex dynamics of regional development. The studies, however, lack a unified theoretical basis holding all possibilities of uneven regional development as different theoretical tools are employed, and thus inevitably lack a complete empirical research framework and targeted empirical research for China.

As a result, our work will be innovative from on both theoretical and empirical perspectives. For theoretical part, this paper unifies political economics theories on uneven development by employing the theories of labor value and capital circulation to construct a relatively complete theoretical framework. For empirical research, this paper explains primary reasons for regional disparities and the dynamic developments with the above-unified theoretical framework, whose explanatory power is thus verified.

2. Theoretical Basis: Two Frameworks of Uneven Regional Development

Although studies analyzing uneven regional development by the theoretical logic of political economics are complicated, the theoretical logic can be classified into two categories: production and exchange, according to Hadjimichalis (1984, 2005).

2.1. Framework of Production

It emphasizes that regional economic disparities stem from production, as the name implies. Its most important work was done by Marxist geographers including Harvey (Harvey, 1975, 2006; Walker, 1978). The basic logic lies in that a region's development depends mainly on its scale and efficiency of production, whose differences result from capital accumulation (Webber *et al.*, 1992; Brenner, 2006). High-level capital accumulation first requires high profit margins. Regions that can offer favorable profit margins for most production will pool the most capital to form accumulation centers. Capital accumulation brings about growth in production scale and productivity,

bringing prosperity and development to a region (Coe *et al.*, 2007).

However, capital accumulation is “self-limiting” itself. As capital accumulation grows, wages continue to rise following the depletion of industrial reserves; land rent increases; large fixed capital investment slows down the capital turnover of an entire region while speeding up part of the capital turnover. All these will cause the profit margins to drop. Other regions, in contrast, may grow to be new accumulation centers by attracting capital flows from the old centers, resulting in uneven development across regions.

2.2. Framework of Exchange

It emphasizes that the impact of exchange on regional development. The primary theoretical tool is “theory of underdevelopment” (Rimmer and Forbes, 1982) developed from 1960s to 1980s, especially the theory of unequal exchange (Emmanuel *et al.*, 1972; Gibson, 1980; Liossatos, 1980).

The logic is that less developed regions generally have low organic composition of capital and high surplus value rate, for low wages and the lack of capital, where the production prices will be lower than the value, resulting in value transfer-out. On the contrary, in developed regions where commodity prices are higher than the value, resulting in value transfer-in. This cross-region value transfer means redistribution amid exchange, so that developed regions occupy part of the value produced by less developed regions, and share more of the total value in use.

The static redistribution extending to the dynamic will further polarize regional development. On the one hand, while equalization of profit margins means that profit margins are similar across regions, developed regions achieve higher-level investment and faster development by capturing part of profit margins of the less developed. And the situation is opposite in less developed regions where the transfer will slow down the capital accumulation and development. On the other hand, for less developed regions, value transfer-out reduces local income, as some of the value created locally is not to be realized locally, causing a shrinkage of the local market to a falling accumulation (Webber, 1996; Hadjimichalis, 2005).

Moreover, the framework emphasizes the presence of technological self-selecting effect amid capital accumulation. Research by Roemer (1981) reveals that the lower the wages, the more favorable it is for corporates to use technologies with low labor productivity and organic composition of capital (Hahnel, 2017). The technological self-selecting effect may be further intensified, if certain geographical factors are introduced. Less developed regions are strong in payroll costs but not in market, infrastructure, location, etc., and only when the advantage of low payroll costs outweigh these weaknesses will corporates invest there. The lower the organic composition of capital, the less payroll costs, and the greater

the probability that the advantage of low payroll costs will outweigh all the weaknesses, eventually leading to the concentration of industries with low organic composition in less developed regions (Webber *et al.*, 1992; Essletzbichler and Rigby, 2005; Feng, 2016).

Not only does technological selection is self-reinforcing, but so is income distribution. On the one hand, the division of labor formed on the basis of low wages in less developed regions means that payroll costs are the most competitiveness to maintain the existing division of labor, which makes a region's will to maintain low wages. On the other hand, low wages reveal that local consumer demand is insufficient and needs to rely on investment or the consumer market outside, which strengthens the local inertia of low wages (Zhang and Feng, 2013).

Furthermore, capital accumulation will endogenously expand production scale to a monopoly. Developed regions are stronger in technological level and production, and are more likely to form strong market forces than the less developed. This allows products in developed regions to raise their selling prices further above production prices, thereby gaining more value to be transferred (Rigby, 1991; Arrighi and Drangel, 1986; Babones, 2005, 2012). In the dynamic sense, the regions of monopoly status occupy more economic surplus, thus are stronger in technology R&D, education input, talent attraction and the formulation of industry standards. That is, the regions of monopoly status will possess more resources to reproduce this monopoly status.

In this exchange-based theoretical framework, we see a different picture from that based on production. Developed regions grow more developed and the less developed grow more backward. Regional development will be “polarizing” instead of converging. It is a dynamic of uneven regional development that is completely different from the changes in regional development.

2.3. Interplay of Two Trends and Uneven Regional Development Dynamics

As is seen from the foregoing description, two frameworks seem to provide two contradictory theories and trends and even have given rise to some controversy on the development of less developed regions (Brenner, 1977; Weeks, 2001). However, this paper holds that both may actually be unified within a single analytical framework and that it is the interplay of the opposing trends that brings about the complex dynamics of uneven regional development.

To illustrate this unity, we may start with the regional income inequality which is static. The most critical factor to a region's income is the value added per unit of working time in each industry or corporate. From the theory of labor value, the added value is understood as the amount of value a region is able to “occupy”, which, as indicated by the basic principles of Labor Theory of Value, is determined by value production and

realization (Marx, 2004a, 2004c; Wei, 1984; Hadjimichalis, 1984, 2005).

For value production, productivity varies for different producers across regions, and individual working times for unit production vary. Thereby it implies that in different regions, the socially necessary working time and the value created per unit working time of producers vary, i.e., the difference in value productivity (Marx, 2004a). The factor is highlighted by the framework of production in explaining regional disparities. Value realization is how much commodity value endowed by production will be “recognized” by the market. If we tentatively do not consider the value lost due to unachievable commodities, value realization is actually a redistribution of the production-endowed value across corporates, industries and regions, i.e. value transfer. Both the production prices formed by profit equalization and the monopoly prices by market forces mean that the actual market prices will deviate from the value, thereby creating the value transfer across industries and regions. This is a factor highlighted in the framework of the exchange.

Since the difference in value added per unit of working time needs the common explanation of value production and value transfer, so in this sense the two frameworks are unified.

Of course, the ultimate purpose, whether it is the framework of production or exchange, is not simply to account for regional disparities in income at a given time, but to explain regional economic dynamics. Capital accumulation is introduced for the characterization of the dynamics in both theories described above. As is found by looking further, the characterization will rely on the interplay between capital accumulation and technology and distribution.

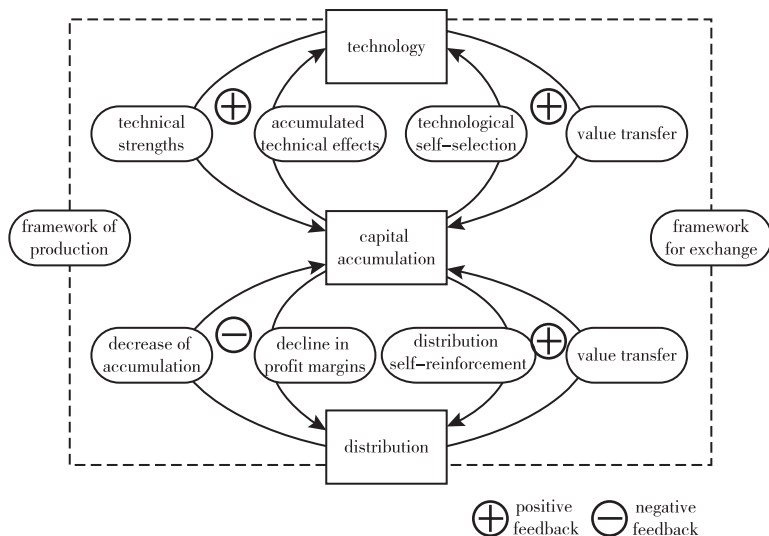


Figure 1. Two Frameworks of Capital Accumulation and Regional Development

Figure 1 shows the relation between capital accumulation and technology and distribution in both frameworks. It reveals that capital accumulation in the framework of production promotes technological advances, which in turn improves productivity, bringing excess surplus value to a region to attract more capital. The relation between capital accumulation and technology in the framework of production is therefore a positive feedback, and will not change the relative level of regional development. Capital accumulation's self-limitation relies on the relation between capital accumulation and distribution, as the growing accumulation will bring about a decrease in profit margins and eventually drive down capital accumulation, thus presenting as a negative feedback.

In the framework of exchange, there is a positive feedback between capital accumulation and technology and distribution. For less developed regions, the technical conditions and low wages posed by the organic composition of low capital as well as the weak market will cause value transfer-out, retarding capital accumulation with less sources of capital and smaller markets. This capital accumulation lag, for one aspect, solidifies the technological disadvantage of latecomer regions by technological self-selection and market forces, and for another, maintains the low-wage state by the demand system of the low-wage system, whereas developed regions are just the opposite. It manifests as self-reinforcing of the respective weaknesses and strengths of developed and less developed regions, eventually leading to a development "polarization" across regions.

Then what really differentiates the framework of production and framework of exchange is the interplay between capital accumulation and distribution. The former holds that a change in distribution allows the surplus in developed regions to flow into less developed regions through capital accumulation or, alternatively, during investment, whereas the latter holds that distribution conditions allow the surplus produced in less developed regions to flow into developed regions by the exchange of commodities or, alternatively, sales. This distinction is quite evident from the point of capital circulation: for the framework of production, value of commodities in developed regions is realized locally, which flows into less developed regions in the form of currency, occurring at the stage when currency is converted into production material and labor. For the framework of exchange, value transfer of commodities occurs at a stage when commodities are converted into currency and value is not realized locally. The two scenarios where less developed regions transfer value out amid exchange and accept value flowing in, in the form of currency, amid investment will perfectly coexist. Currency inflow or outflow amid investment, along with the value transfer-in and out amid exchange, achieves the full impact of capital circulation on capital accumulation (Harvey, 2018). The developmental dynamics of a region depend on the contrast of two different effects caused by the net inflow of currency amid investment versus the net transfer out of value through exchange.

With the above theory, it is able to unify production-based and exchange-based theoretical logics and constitute a theoretical framework capable of revealing complex dynamics. Central to this framework is to unify the roles of capital accumulation in production and exchange, as capital accumulation is core to describing regional development dynamics under both theoretical logics. Figure 2 presents a review and unity of the two theoretical logics from the theory of capital circulation.

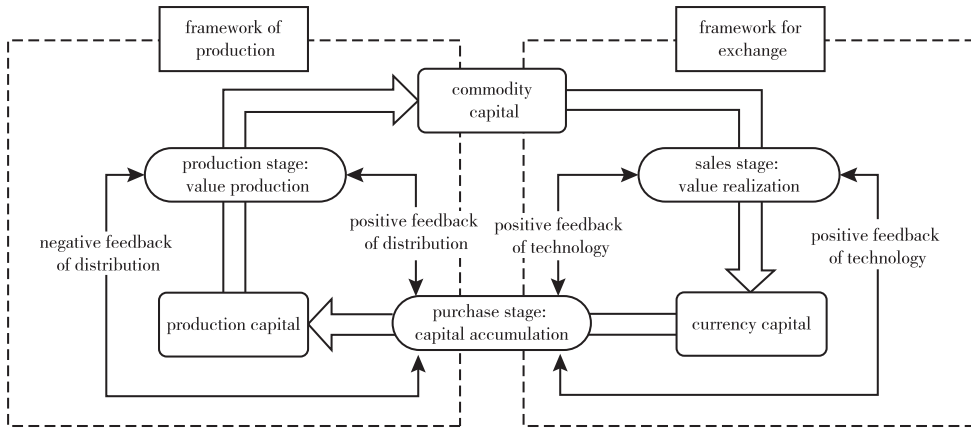


Figure 2. Frameworks of Production and Exchange from the Perspective of Capital Circulation

2.4. Role of Government

The government's role in regional development is a very complicated issue. However, our theoretical framework still offers a fundamental insight into the government's role in the uneven regional development: under the market economy and regardless of specific institutional details, the dynamics by which the government influences regional imbalances will require interventions at different stages of capital circulation to change the environment of value production, realization and capital accumulation, and thereby to influence the interrelationships among these processes.

Then the government's actions influencing regional development may be grouped into three categories: the first category acts on the production stage. The most primary is to subsidize capital for production. Such policies grow profit margins by improving the environment of value production and productivity or changing the primary distribution ratios of factors for production, and make use of the interaction between value production and capital accumulation to improve the regional level of capital accumulation and development. The second category works at the sales stage mainly to expand the region's market, such as cross-regional transfer payments or borrowing to expand the consumption scale, or adjustment of income distribution to improve the effective demand. These measures aim to improve conditions for value

realization locally, and with the interaction between value realization and capital accumulation, the regional development will be improved. The third category acts on the purchasing stage. The government may concentrate capital directly by means of local fiscal revenue or the surplus of other regions through transfer payments and debts. The corresponding investment and financing system will also make it easier for local market players to access the funds for capital accumulation (Cohn, 2012). Different types of government may have different purpose when employing these policies. However, whatever the policy objectives are, it must act on the three stages of the capital circulation to reach its policy objectives with the interplay between capital accumulation and value production and realization (Foley, 1978; O'Connor, 2017). That is to say, the government's policies influencing regional development are applied at three stages, but the ultimate goal is still to concentrate capital. For this reason, when analyzing the dynamics later, the focus will also be on how market laws and the government jointly shape the capital accumulation at the regional level in China.

3. Static Disparities in Regional Development: Interpretation about Per Capita GDP Differences

The theoretical framework of this paper statically illustrates how value production and value transfer explain the regional disparities in value added per unit of working time, which are key to causing the differences in per capita GDP. This section calculates the regional differences in value production and value transfer to show if the two factors well explain regional differences in per capita GDP.

3.1. Decomposition of Per Capita GDP

Per capita GDP is widely applied to measure regional disparities in development. In political economics, this indicator reveals productive differences across regions and is considered to represent a region's ability to benefit from division of labor and monopoly, i.e. the degree of value transfer. The unity of value production and value transfer revealed by per capita GDP is shown in the following decomposition:

$$\frac{my'}{P} = \frac{my'}{lx'} \frac{lx'}{L} \frac{L}{P} \quad (1)$$

In equation (1), y' : column vector of net product for a given region; m : row vector of market prices per unit product; my' : gross GDP of the region; P : gross population; my'/P : per capita GDP of the region; L : actual number of labor employed in the region; L/P : ratio of labor employed to the gross population; x' : column vector of gross product for a given region; l : row vector of the direct labor input coefficient; lx' : gross amount of

direct labor input expressed in time for a region; lx'/L : average working time of each labor; my'/lx' : average value added per unit of working time of a region, the index emphasized in the theoretical section which contains dual functions: value production and transfer, and is also a key factor explaining the per capita GDP differences across regions.

Further decomposition of my'/lx' yields the following equation:

$$\frac{my'}{lx'} = \frac{my'}{mx'} \left[\frac{(m-\lambda)x'}{lx'} + \frac{(\lambda-\tau)x'}{lx'} \frac{\tau x'}{lx'} \right] \quad (2)$$

In equation (2), λ : row vector of value; τ : row vector of individual value; $(m-\lambda)x'$: degree of deviation between aggregate market prices and aggregate value; $(m-\lambda)x'/lx'$: ratio of value transfer to gross labor input; $(\lambda-\tau)x'$: difference between value and individual value; $(\lambda-\tau)x'/lx'$: ratio of value productivity gap to gross labor input; my'/mx' : rate of product value added for a given region expressed in market prices; $\tau x'/lx'$: inverse of the rate of value added measured by individual working time. They are the factors that convert gross output into net output.

Per capita GDP is finally expressed as:

$$\frac{my'}{P} = \frac{my'}{mx'} \left[\frac{(m-\lambda)x'}{lx'} + \frac{(\lambda-\tau)x'}{lx'} \frac{\tau x'}{lx'} \right] \frac{lx'}{L} \frac{L}{P} \quad (3)$$

In this way, per capita GDP is decomposed into value productivity, value transfer, value-added rate, average working time and the ratio of labor.

3.2. Measurement of Value and Individual Value

To calculate the value production gap and value transfer, we need the gross individual value, the gross value and gross market prices of each industry in each region, and then calculate the difference between each two sets of figures separately, and add up the differences of all industries in each region for each component. Gross output value is directly available from input-output data, so it needs to calculate only the individual value and the value.

3.2.1. Measurement of Value

First, a country's value of different industries is given by the following equation, according to the approach of Ochoa (1989):

$$\lambda = l(I - A - D)^{-1} \quad (4)$$

In equation (4), A is the intermediate input matrix with a_{ij} denoting the number of products from industry i required by industry j to produce per unit of product. D is the fixed capital depreciation matrix with d_{ij} denoting the depreciation of fixed capital products from industry i required by industry j to produce per unit of product. I is the unit matrix. This paper refers to technical details provided by Marelli (1983) in employing the above approach to the value-based input-output tables and for how to use the national input-output tables to calculate the gross value of different sectors in different regions.

3.2.2. Measurement of Individual Value

For calculating individual value, this paper takes a region's intermediate input coefficient, fixed capital depreciation coefficient and direct labor input as its technological symbols. The estimated gross working time of different sectors in a region is the individual value of each sector in the region. That is to say:

$$\tau_h = l_h (I - A_h - D_h)^{-1} \quad (5)$$

A_h , D_h and l_h is the intermediate input coefficient matrix, fixed capital depreciation coefficient matrix and direct labor input row vector respectively of h region. τ_h is row vector of individual value for h region.

In this way we have the individual value and value of each sector in different regions. Finally, to make the variables comparable, this paper converts the three sets of data into a single currency unit by the approach of Ochoa (1989).

3.3. Data Sources

The above empirical research approach is largely informed by the information in input-output tables. Among them, the intermediate input coefficient matrix A and the regional intermediate input coefficient matrix A_h can be directly obtained from China's input-output table and provincial input-output table. For the estimation of D , we first multiply the gross fixed capital depreciation D_j of sector j with the ratio of the products of sector i used as investments to the gross investment in sector j to obtain the depreciation D_{ij} of the fixed capital produced by sector i used by sector j , which is then divided by the gross output of sector j to obtain the estimated fixed capital depreciation factor $\hat{d}_{ij}$. For the gross labor input time of each sector, we first obtain the industry's average number of labors by dividing the gross amount of labor remuneration from different sectors in each region according to the input-output table by the industry's average labor remuneration given in the China Labor Statistics Yearbook for the current year. Then, the industry's gross number of direct labor hours in a year is

estimated by multiplying the weekly working time of labors from each industry in China Labor Statistics Yearbook with the number of labor.

3.4. Empirical Results

Table 1 shows the correlation coefficient between value production gap of unit working time, value transfer per unit working time and per capita GDP in 2002, 2007 and 2012. It shows that the value production gap and value transfer per unit of working time are closely related to per capita GDP, both of which are positively correlated at the significance level of 1%. This preliminarily illustrates the close relations among value productivity gap, value transfer and regional disparities.

Table 1. Correlation Coefficient between Value Production Gap, Value Transfer and Per Capita GDP

	Per capita GDP (2002)	Per capita GDP (2007)	Per capita GDP (2012)
Value production gap per unit working time	0.847***	0.846***	0.714***
Value transfer per unit working time	0.967***	0.869***	0.772***

To further illustrate the importance of value productivity gap and value transfer to per capita GDP differences, the following approach is applied: per capita GDP in each region of ideal state is calculated by assuming either the value production gap or value transfer do not exist. Then its coefficients of variation and Gini Coefficient are compared with the coefficients in real situation, thereby illustrating to what extent value production and transfer affect per capita GDP differences.

Table 2. Inequalities of Real Per Capita GDP and Assumed Per Capita GDP

	Coefficient of variation		
	2002	2007	2012
Real per capita GDP	0.706	0.611	0.447
Per capita GDP without value production gap and value transfer	0.344	0.305	0.309
Per capita GDP without value production gap	0.364	0.375	0.338
Per capita GDP without value transfer	0.570	0.476	0.392
	Gini coefficient		
	2002	2007	2012
Real per capita GDP	0.322	0.297	0.233
Per capita GDP without value production gap and value transfer	0.184	0.170	0.164
Per capita GDP without value production gap	0.199	0.206	0.181
Per capita GDP without value transfer	0.279	0.248	0.210

As shown in Table 2, compared with the real per capita GDP, the coefficient of variation and Gini Coefficient of per capita GDP without value production gap and value transfer fell significantly in the three years. The coefficient of variation fell by more than 50% in 2002 and 2007 and by nearly a third in 2012. The Gini Coefficient dropped below 0.3. More importantly, under this assumption, the downward trend of per capita GDP inequality has also weakened markedly. It indicates that the value production gap and value transfer explain primary differences in cross-section, and their changing trend is also the primary reason for changing per capita GDP differences over time.

Also, Table 2 also reveals the per capita GDP inequality when assuming the absence of only value production gap or value transfer. It finds that the coefficient of variation and Gini Coefficient of per capita GDP decrease significantly compared with the reality and are closer to that when assuming neither value transfer nor value production gap exists. Relatively, when only value transfer is assumed not to exist, both coefficients also decline significantly though, the decline is much smaller. Therefore, it may say that the value production gap plays a major role in influencing regional differences in per capita GDP.

4. Uneven Regional Development Dynamics

Whether the free market or the government's influence on uneven regional development, the final stance lies in capital accumulation, according to this paper. Therefore, capital accumulation is the main object of dynamics analysis.

4.1. Value Flow and Uneven Development Dynamics amid Capital Accumulation

As stated in the theoretical section, changes in regional disparities largely depend on the relative relation between positive and negative feedbacks arose by interactions between capital accumulation and production and exchange. This relation is a comparison between value flow amid accumulation and value transfer amid exchange. Now it will explain how this comparison changes over time.

We first need to calculate a region's value inflow at the stage of capital accumulation. The following identity will illustrate this:

$$CD + ID + CF + IF + MF = IND + EX + VT \quad (6)$$

Equation (6) is a capital flow identity, the right hand side of which is the source of monetary income for a region, where *IND* denotes the net income from goods and services sold locally, *EX* the net income from goods and services-sold non-locally, and *VT* the monetary transfer from other regions. On the left side of (6) is the monetary

expenditure of a region. CD denotes the expenditure on purchasing consumer goods produced in the local region, ID denotes the expenditure on purchasing capital goods produced in the local region, CF denotes the expenditure on purchasing consumer goods produced in other regions, IF denotes the expenditure on purchasing capital goods produced in other regions, and MF denotes the monetary transfer to other regions. What we are concerned about is a region's net inflow of currencies, i.e. $VT-MF$. Obviously, the purchase of local goods and service equals the sale of local goods and services, so $CD+ID=IND$. Then $VT-MF=CF+IF-EX$, i.e. the net inflow of currency in the region equals the net inflow of goods and services in the region (Lu and Yu, 2012). Data on net inflows of goods and services in a region are available from the National Bureau of Statistics (NBS). To facilitate the comparison of value production gap and value transfer, this paper converts the regional net inflow of goods and services as the form of net inflow of goods and services per unit working time.

Table 3. Relation between Value Inflow amid Accumulation and Value Production Gap and Value Transfer

	Value flow amid accumulation		
	2002	2007	2012
Value production gap per unit working time	-0.2593	-0.4583**	-0.2625
Value transfer per unit working time	-0.3386*	-0.3677**	-0.1308

Table 3 shows the relations between value flow during capital accumulation and value production gap and value transfer. Data reveal that China's capital accumulation leans towards less developed regions to somewhat extent. Thus as is discussed in the theoretical section, monetary and capital flows weaken the positive feedback in regional development.

Table 3 provides only directional evidence. To explain it more intuitively, this paper directly compares value flow in capital accumulation with value transfer amid exchange to illustrate their relative magnitude. Here we introduce the concept of net value inflow, that is, the net value inflow by exchange plus that during capital accumulation. It means that the entire region is favorable for development when having net value inflow; and conversely a region with net value outflow is at a disadvantage stage. Theoretically, the more dispersed the distribution of net value inflow nationwide, the stronger differentiation of regional disparities will be, and otherwise the weaker differentiation of regional disparities and the greater the possibility of even regional development.

Figure 3 shows time-varying kernel density distributions of net value inflows. The 2002–2007 part shows that the right tail is right-skewed and left tail is left-skewed, indicating a differentiation of net value inflows across regions. In 2007–2012, the right

tail of distribution contracted obviously, and the distribution was concentrated around 0. In fact, the variance of net value inflows also first rose and then fell. Inferred from this result, the negative feedback of production is exceeding the positive feedback of exchange nationwide. It suggests China will witness the narrowing of regional disparities in the future. The fact that the regional income inequality continues to shrink after 2012 has explained it to some extent (Lu *et al.*, 2019).

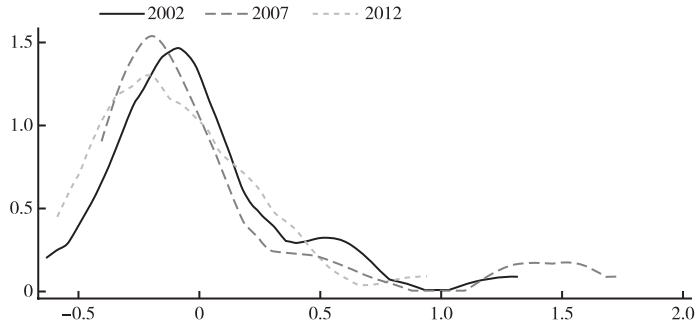


Figure 3. Kernel Density Distributions of Net Value Inflows

4.2. Capital Accumulation and Uneven Regional Development Dynamics

4.2.1. Factors Influencing Capital Accumulation

The factors influencing regional capital accumulation are numerous and complex. This paper attempts to describe the basic regularities and modes of capital accumulation. Therefore we will discuss the most important factors influencing capital accumulation.

First, profit margins are the primary factor influencing capital accumulation, as is known from the basic theory of Marxist economics, and may be divided into profit share, capacity utilization rate and potential output-to-capital ratio, according to the classical analysis framework of Weisskopf (1979) and the subsequent addition of Foley and Michl (1999).

Profit share is the ratio of profits to the added value and mainly reveals distributional factors, and from the regional level perspective, it also shows productivity and the acquisition of excess surplus value. Less developed regions, where the wages per unit of working time are generally lower, tend to increase the profit share in distribution; the added value per unit of working time is also lower, which will lead to reduced profit share. The opposite is true in developed regions. Capacity utilization rate reflects the impact of reality factors on profit margins. Due to the negative impact during exchange, the conditions for value realization in less developed regions are worse, so the capacity utilization rate should be lower than that in developed regions. Potential

output-to-capital ratio is the ratio of output to capital under normal capacity utilization rate, revealing the impact of the organic composition of capital on profit margins.

Second, Marxist geographers take geographic factors into consideration and suggest that a region's capital share in the national total is a factor influencing investment. The reason is that this share shows the difference in "investment opportunities" across regions and exemplifies the path dependence and evolutionary nature underlying capital accumulation in geographic space (Webber, 1996). The capital share in total social capital should be higher in developed regions than the less developed because of their first-mover status.

4.2.2. Estimating Strategies

In specific estimation methods, this paper follows the approaches of Basu and Das (2017): firstly, the dynamic panel method is applied to control the influence of omitted variables which do not change with time. Second, the dynamic effect of capital accumulation will be captured by adding lag terms of explained variables. Thirdly, the interpreted variables are set as pre-determined variables or endogenous variables, and the difference and lag items of the variables are taken as tool variables. With the above three approaches, we hope to be able to control the endogeneity problems that may arise in the estimation. At the same time, the first- and second-order lag terms of explaining variables are introduced, and the long-term impact of explained variables on capital accumulation is estimated by the first-order lag terms of explained variables and the coefficients of explained variables and their first-and second-order lag terms (Arellano and Bond, 1991; Bond, 2002).

From above strategies, the Foley-Michl accumulation equation is as follows:

$$ik_{i,t} = \alpha ik_{i,t-1} + \beta_0 + \beta_1 ry_{i,t} + \beta_2 ry_{i,t-1} + \beta_3 ry_{i,t-2} + \beta_4 cu_{i,t} + \beta_5 cu_{i,t-1} + \beta_6 cu_{i,t-2} \\ + \beta_7 yk_{i,t} + \beta_8 yk_{i,t-1} + \beta_9 yk_{i,t-2} + \beta_{10} ks_{i,t} + \beta_{11} ks_{i,t-1} + \beta_{12} ks_{i,t-2} + \delta_i + \xi_{i,t}$$

t : time; i : province; ik : accumulation level of explained variables; ry : profit share; cu : capacity utilization rate; yk : potential output-to-capital ratio; ks : the region's capital share in the national capital; δ_i : unobservable fixed effects; $\xi_{i,t}$: random error term. Similarly, according to the approaches of Basu and Das (2017), we will estimate the long-term effect of explaining variables by dividing the sum of each explaining variable and its first- and second-order lag terms by $1-\alpha$. For example, we may estimate the long-term effect multiplier of profit share on capital accumulation level by $(\beta_1+\beta_2+\beta_3)/(1-\alpha)$. The standard error of the long-term effect multiplier is estimated using the Delta approach.

For specific estimation methods, the System GMM in the dynamic panel approach

is a more efficient estimation strategy, which is able to deal with the stronger persistence of explained variables to some extent. It is important for estimating the accumulation equation, as the accumulation is usually somewhat persistent, but we also report the results of differential GMM for the sake of robustness. On the choice of the one- or two-step approach, the answer is the two-step approach, also according to Basu and Das (2017). For the setting of exogenous variables, we consider the above four explained variables as basic influencing factors for capital accumulation. Since the probability of being exogenous variables is small, the focus will be put on setting them as pre-determined or endogenous variables. This paper choose the safest choice to regard the explaining variables to be endogenous, as the assumptions required are the weakest. Nevertheless, this paper will still report estimation results of explaining variables as the pre-determined variables and exogenous variables to support the conclusions of the main regression results.

4.2.3. Data Sources

We use total capital formation to represent a region's accumulation level and divide it by the region's total fixed capital to eliminate the scale impact. The total capital formation is from the NBS and the fixed capital is estimated according to according to the approach of Shan (2008) with data from the corresponding years of China Statistical Yearbook and the provincial statistical yearbooks. The profit share is denoted by the ratio of a region's operating surplus to GDP. The provincial operating surplus and GDP data are from the NBS. Data of capacity utilization rate are from the estimation of Huang *et al.* (2018). Finally, regional capital share in the national total is calculated using estimates of the fixed capital of each province.

Since the period of capacity utilization data by the study of Huang *et al.* (2018) is 2001–2015, the sample period of this paper will be 2001–2015.

4.2.4. Estimation Results

Table 4 presents the primary estimation results. All the differential GMM and systematic GMM results are nonsignificant by Sargan test under the 10% significance level and the perturbation terms have no second-order autocorrelation. It means the premise of the applied model holds. As is shown therein, the direction, magnitude and significance levels of the estimation coefficients of primary short-term effects and long-term effects are highly consistent under different methods, indicating that the results are highly robust.

The most concern in all models is with the System GMM estimate where all explaining variables are endogenous, followed by the System GMM estimate where the explaining variables are set as pre-determined variables, and other GMM estimation

results are ranked the last for reference. It may find that profit share has a significant short-term effect on the accumulation level, but the long-term effect is not significant. It suggests that the advantage of developed regions in profit share does not accumulate in the long run, despite attracting investment in the short run. In political economics, profit share is both the driver and the source of capital accumulation. This paper believes that the above results with significant short-term effect and insignificant long-term effect, on the one hand, show the profit share indeed influences investment, but what influences investment is the current value, and investors consider less about the level of profit share in the longer term. On the other hand, corporates may obtain more funds through external financing (such as bank credit) which is also available to less developed regions. Therefore, the long-term effect of profit share, which influences the sources of accumulation, is not apparent.

Table 4. Estimation Results of Accumulation Equation

Variable	(1) OLS	(2) Bidirectional FE	(3) Differential GMM (exogenous)	(4) Differential GMM (predetermined)	(5) Differential GMM (endogenous)	(6) System GMM (exogenous)	(7) System GMM (predetermined)	(8) System GMM (endogenous)
<i>L.ik</i>	0.911*** (0.027)	0.751*** (0.044)	0.714*** (0.010)	0.769*** (0.013)	0.760*** (0.013)	0.705*** (0.010)	0.806*** (0.014)	0.787*** (0.010)
<i>ry</i>	0.015 (0.039)	-0.0007 (0.048)	0.036*** (0.010)	0.033** (0.013)	0.027* (0.015)	0.060*** (0.011)	0.038*** (0.014)	0.033** (0.013)
<i>cu</i>	-0.095 (0.083)	-0.142 (0.089)	-0.150*** (0.020)	-0.161*** (0.029)	-0.146*** (0.027)	-0.158*** (0.018)	-0.167*** (0.024)	-0.160*** (0.019)
<i>yk</i>	-0.0927 (0.134)	-0.184* (0.090)	-0.153*** (0.010)	-0.139*** (0.012)	-0.130*** (0.012)	-0.217*** (0.012)	-0.141*** (0.013)	-0.140*** (0.013)
<i>ks</i>	7.998*** (1.798)	9.614*** (3.027)	9.442*** (2.134)	13.84*** (4.389)	12.17*** (3.279)	9.300*** (4.193)	7.654* (4.231)	7.934** (3.957)
Long-term effect multiplier								
<i>ry</i>	-0.303 (0.417)	-0.077 (0.161)	0.048* (0.030)	0.030 (0.057)	0.014 (0.064)	0.042* (0.029)	0.062 (0.069)	0.058 (0.057)
<i>cu</i>	0.303 (0.869)	0.446*** (0.183)	0.048 (0.058)	0.214** (0.119)	0.133* (0.097)	0.120** (0.053)	0.122 (0.107)	0.114* (0.079)
<i>yk</i>	0.585 (1.428)	0.505*** (0.182)	0.526*** (0.045)	0.635*** (0.065)	0.626*** (0.066)	0.507*** (0.051)	0.598*** (0.068)	0.566*** (0.057)
<i>ks</i>	0.063 (20.663)	2.636 (12.850)	1.525 (7.884)	2.797 (19.696)	4.769 (14.279)	1.974 (15.117)	-1.428 (23.168)	-0.047 (19.766)
Constant	-0.019** (0.009)	-0.115** (0.049)	-0.049** (0.022)	-0.086*** (0.024)	-0.089*** (0.023)	-0.065*** (0.022)	-0.029 (0.022)	-0.036* (0.022)
Observations	377	377	348	348	348	377	377	377
R-squared	0.992	0.922						

Note: The standard errors are shown in the brackets in this table.

Capacity utilization rate has a negative effect in the short term and a relatively weak positive effect in the long term. This situation might be understood as the investment responding slowly to conditions for value realization. When a region's products fail to materialize, corporates do not cut investment immediately but slowly thereafter, and do not completely withdraw short-term overinvested capacity in the long run. This may have to do with China's industrial structure, where the manufacturing has higher proportion, larger investment scale and longer investment cycle, so the speed of adjustment will inevitably be slow. On the other hand, this may be related to China's special investment system. China's investors include the government and state-owned enterprises (SOEs). These investments are all policy-oriented and will not be based solely on market changes.

The impact of potential output-capital ratio also has negative effects in the short run but significant positive effects in the long run. From the simple behavior of capital accumulation, it may hold that in the short run, a region's improvement in the organic composition of capital is accompanied by its productivity progress, so an improving organic composition of capital will attract more investment. In the long run, however, the organic composition of capital will bring about a decline in profit margins after the equalization to lead to investment outflow. There is another reality-based explanation with Chinese characteristics. That is, less developed regions' high potential output-to-capital ratio reveals their backward infrastructure and relatively low-level industrialization and urbanization. Then the government will put more efforts on infrastructure construction in these regions to improve their industrialization and urbanization.

The share of capital in the national total has only a short-term positive effect and will not mount in the long run. It suggests that the number of "investment opportunities" in the short run does influence investment, but the regional path dependence effect of China's investment is small (Sunley, 2000). The reasons may be: first, the mechanism of investment decision-makers does not only consider profitability; and second, the government may create investment opportunities and investment environment by policies to make up for less developed regions.

It is easy to see that capital accumulation at the regional level in China is the result of both market regularities and government actions. With no government policy intervention, developed regions are supposed to enjoy a larger share of profits, better market conditions and more investment opportunities, and higher profit margins as well, and a higher organic composition of capital will improve productivity in the short term. As a result, developed regions will accumulate on a larger scale, and in addition to value inflow in the exchange, they can prevent capital and value outflow at the accumulation stage to a great extent. Capital accumulation biased towards less developed regions will be hard to happen and regional disparities will continue to widen.

But the Chinese government's policies at the regional level have reshaped the accumulation. Profit share and capital share, two favorable factors for developed regions, mainly act in the short term, and the impact of value realization on investment decisions is weakened to a certain extent. In fact, this shows that market mechanisms are still important for investment decision-making, but the positive feedback in accumulation and exchange is suppressed. The financing models biased towards less developed regions, the creation of investment opportunities and environment by local governments and the investment decision-making mechanism of the Chinese government and public-owned enterprises, etc., keep the developed regions' strengths from accumulating in the long run, thus preventing the "lock-in" and "polarization" of the development trajectory of developed and less developed regions.

5. Conclusions

This paper aims to understand China's uneven regional development in recent years by applying political economics theories. There summarizes two theories from the political economics on uneven regional development—framework of production and framework of exchange—and unifies them by theories of labor value and capital circulation. It aims to show that uneven regional development will be explained with value production, value realization and capital accumulation, and their interactions as well. Empirical research finds that the theoretical frameworks can explain, statically, regional disparities in development and income, and dynamically, developments of regional disparities—rising first and then falling since the socialist market economy. Specifically, China's regional disparities result mainly from the value productivity gap. Amid the dynamic evolution, with a capital accumulation biased towards less developed regions, the trend of reducing regional disparities contained in the accumulation-production interaction has exceeded the "polarization effect" brought about by the accumulation-exchange interaction after 2007, narrowing regional disparities in development. The accumulation biased towards less developed regions is the result of market logic and government behavior together.

References

- Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, 58(2), 277–297.
- Arrighi, G., & Drangel, J. (1986). The Stratification of the World-Economy: an Exploration of the Semiperipheral Zone. *Review (Fernand Braudel Center)*, 10(1),

9–74.

- Babones, S. (2005). The Country-Level Income Structure of the World-Economy. *Journal of World-Systems Research*, 11(1), 29–55.
- Babones, S. (2012). Position and Mobility in the Contemporary World-Economy: A Structuralist Perspective. *Routledge Handbook of World-Systems Analysis*, 327–335.
- Basu, D., & Das, D. (2017). Profitability and Investment: Evidence from India's Organized Manufacturing Sector. *Metroeconomica*, 68(1), 47–90.
- Bond, S. (2002). Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice. *Portuguese Economic Journal*, 1(2), 141–162.
- Brenner, R. (1977). The Origins of Capitalist Development: A Critique of Neo-Smithian Marxism. *New Left Review*, 104, 25–92.
- Brenner, R. (2006). *The Economics of Global Turbulence: The Advanced Capitalist Economies From Long Boom To Long Downturn, 1945–2005*. New York: Verso.
- Cai, F., Wang, D., & Du, Y. (2001). Impact of a Distorted Labor Market on Regional Disparities. *Social Sciences in China (Zhongguo Shehui Kexue)*, 2, 4–14.
- Coe, N., Kelly, P., & Yeung, H. (2007). *Economic Geography: A Contemporary Introduction*. Oxford: Blackwell Publishing.
- Cohn, S. (2012). O'Connorian Models of Peripheral Development—or How Third World States Resist World-Systemic Pressures by Cloning the Policies of States in the Core. *Routledge Handbook of World-Systems Analysis*, 336–344.
- Emmanuel, A., Bettelheim, C., & Pearce, B. (1972). *Unequal Exchange: A Study of the Imperialism of Trade*. New York: Monthly Review Press.
- Essletzbichler, J., & Rigby, D. (2005). Competition, Variety and the Geography of Technology Evolution. *Tijdschrift Voor Economische En Sociale Geografie*, 96(1), 48–62.
- Feng, C., Zeng, Z., & Cui, N. (2015). Spatial and Temporal Evolution of Regional Economic Disparities in China Since 2000. *Geographical Research (Dili Yanjiu)*, 2, 234–246.
- Feng, Z. (2016). Historical Dynamics of Unequal Exchange: An Empirical Study. *China Review of Political Economy (Zhengzhi Jingjixue Pinglun)*, 2, 60–82.
- Foley, D., & Michl, T. (1999). *Growth and Distribution*. Cambridge: Harvard University Press.
- Foley, D. (1978). State Expenditure from a Marxist Perspective. *Journal of Public Economics*, 9(2), 221–238.
- Gibson, B. (1980). Unequal Exchange: Theoretical Issues and Empirical Findings. *Review of Radical Political Economics*, 12(3), 15–35.
- Hadjimichalis, C. (1984). The Geographical Transfer of Value: Notes on the Spatiality of Capitalism. *Environment and Planning D: Society and Space*, 2(3), 329–345.
- Hadjimichalis, C. (2005). *Uneven Development and Regionalism: State, Territory and*

- Class in Southern Europe*. London: Routledge.
- Hahnel, R. (2017). A Tale of Three Theorems. *Review of Radical Political Economics*, 49(1), 125–132.
- Harvey, D. (2018). *Marx, Capital and the Madness of Economic Reason*. China CITIC Press. (in Chinese)
- Harvey, D. (1975). The Geography of Capitalist Accumulation: A Reconstruction of the Marxian Theory. *Antipode*, 7(2), 9–21.
- Harvey, D. (2006). *The Limits to Capital*. New York: Verso.
- Hu, A., Zhou, S., Lu, Y., & Di, W. (2015). Rebuilding China Economic Geography: From Version 1.0 to Version 4.0. *Economic Geography (Jingji Dili)*, 12, 1–10.
- Huang, X., Ge, P., & Wu, X. (2018). The Cross-Industry Characteristics and Difference Decomposition of China's Industrial Capacity Utilization Rate. *The Journal of Quantitative & Technical Economics (Shuliang Jingji Jishu Jingji Yanjiu)*, 9, 60–77.
- Lin, Y., & Liu, P. (2003). China's Economic Development Strategy and Regional Income Gap. *Economic Research Journal (Jingji Yanjiu)*, 3, 19–25+89.
- Liosatos, P. (1980). Unequal Exchange and Regional Disparities. *Papers in Regional Science*, 45(1), 87–103.
- Lu, F., & Yu, Y. (2012). Double Surplus, Capacity Gap and Independent Innovation—Macro & Micro Perspectives of Transforming Economic Development Mode. *Social Sciences in China (Zhongguo Shehui Kexue)*, 6, 91–114+207.
- Lu, M., Li, P., & Zhong, H. (2019). A New Era of Development and Balance—70 Years of Spatial Political Economy in the People's Republic of China. *Management World (Guanli Shijie)*, 10, 11–23+63–219.
- Marelli, E. (1983). Empirical Estimation of Intersectoral and Interregional Transfers of Surplus Value: The Case of Italy. *Journal of Regional Science*, 23(1), 49–70.
- Marx, K. (2004a). *Capital (Volume I)*. People's Publishing House. (in Chinese)
- Marx, K. (2004b). *Capital (Volume II)*. People's Publishing House. (in Chinese)
- Marx, K. (2004c). *Capital (Volume III)*. People's Publishing House. (in Chinese)
- O'Connor, J. (2017). *The Fiscal Crisis of the State*. Shanghai University of Finance & Economics Press. (in Chinese)
- Ochoa, E. (1989). Values, Prices, and Wage-Profit Curves in the US Economy. *Cambridge Journal of Economics*, 13(3), 413–429.
- Rigby, D. (1991). The Existence, Significance, and Persistence of Profit Rate Differentials. *Economic Geography*, 67(3), 210–222.
- Rimmer, P., & Forbes, D. (1982). Underdevelopment Theory: A Geographical Review. *Australian Geographer*, 15(4), 197–211.
- Roemer, J. (1981). *Analytical Foundations of Marxian Economic Theory*. Cambridge: Cambridge University Press.
- Shan, H. (2008). Re-Estimation of China's Capital Stock K: 1952–2006. *The Journal of Quantitative & Technical Economics (Shuliang Jingji Jishu Jingji Yanjiu)*, 10,

17–31.

- Sunley, P. (2000). Urban and Regional Growth. *A Companion to Economic Geography*, Oxford: Blackwell Publishing, 187–201.
- Walker, R. (1978). Two Sources of Uneven Development under Advanced Capitalism: Spatial Differentiation and Capital Mobility. *Review of Radical Political Economics*, 10(3), 28–38.
- Wang, C., Wan, G., & Zhang, X. (2019). Regional Differences & Structural Changes in China (1978–2016). *Management World (Guanli Shijie)*, 6, 11–26+194.
- Webber, M. (1996). Profitability and Growth in Multiregion Systems: Theory and a Model. *Economic Geography*, 72(3), 335–352.
- Webber, M., Sheppard, E., & Rigby, D. (1992). Forms of Technical Change. *Environment and Planning A*, 24(12), 1679–1709.
- Weeks, J. (2001). The Expansion of Capital and Uneven Development on a World Scale. *Capital and Class*, 74, 9–30.
- Wei, X. (1984). Value Determination and Social Necessary Working Time of Two Meanings. *Economic Research Journal (Jingji Yanjiu)*, 1, 47–53+46.
- Weisskopf, T. (1979). Marxian Crisis Theory and the Rate of Profit in the Postwar US Economy. *Cambridge Journal of Economics*, 3(4), 341–378.
- Zhang, C., & Feng, Z. (2013). Technological Backwardness, Excessive Exploitation and Economic Imbalance. *Marxist Research (Makesizhuyi Yanjiu)*, 9, 88–97.