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Patterns and Determinants of Off-Farm Migration

Transfer frictions and persistency of relative income gaps

ABSTRACT

The inter-sectoral migration of agricultural labour is a complex but fundamental process of economic development largely affected by the growth of agricultural productivity and the evolution of the agricultural relative income gap. Theory and some recent anecdotal evidence suggest that as an effect of large fixed and sunk costs of out-farm migration, the productivity gap between the agricultural and non-agricultural sectors should behave non-monotonically or following a U-shaped evolution during economic development. Whether or not this relationship holds true across a sample of 38 developing and developed countries and across more than 200 EU regions was empirically tested. Results strongly confirm this relationship, which also emphasises the role played by national agricultural policy.

FACTOR MARKETS Working Papers present work being conducted within the FACTOR MARKETS research project, which analyses and compares the functioning of factor markets for agriculture in the member states, candidate countries and the EU as a whole, with a view to stimulating reactions from other experts in the field. See the back cover for more information on the project. Unless otherwise indicated, the views expressed are attributable only to the authors in a personal capacity and not to any institution with which they are associated.

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1. Introduction

Changes in resource allocation as a result of structural changes such as labour migration represent one of the most important engines driving economic growth and development. The most complex form of resource adjustment during economic development is the migration of labour out of the agricultural sector. Labour is the most important factor in determining national income, therefore, countries that manage to pull themselves out of poverty are those that are able to diversify away from the agricultural sector. This occurs because labour moves from agriculture into the industrial sector, with overall productivity rising and income growing due to sector convergence in labour productivity. However, the speed with which this structural transformation takes place is a fundamental factor that differentiates successful countries and regions from unsuccessful ones (McMillan and Rodrik, 2011).

One of the key variables that both governs and is affected by structural change is the existence of productivity gaps between sectors. Large differences in labour productivity across sectors are traditionally found in developing countries, but also across regions in more developed countries such as member states of the European Union. These differences are at the heart of allocative inefficiencies that ultimately reduce overall GDP per capita. Consequently, understanding the magnitude and dynamics of the actual income gap between agriculture and non-agricultural sector is a useful exercise in speculating about the potential gains from out-farm labour migration and the convergence process.

As emphasised by dual-economy models (Lewis, 1954), the productivity gap between the agricultural and non-agricultural parts of the economy behaves non-monotonically during economic growth. It shows a gap that first increases and then falls, and forms a U-shaped pattern during economic development. One of the key reasons behind this pattern is found in the lower rate of agricultural labour reallocation compared to other production factors as a consequence of the fixed and sunk costs that farmers incur when they move between sectors (Mundlak, 2000; Dennis and Iscan, 2007).[1]

McMillan and Rodrik (2011) documented interesting stylised facts in support of this relationship for a sample of 38 developed and developing countries. Similarly, Hayami (2007) reports evidence of this relationship for high-performing economies in Asia, suggesting that their transition from a low-income to a middle-income stage through industrialisation has generated a widening income gap between farm and non-farm workers – corresponding to rapid shifts in comparative advantage from agriculture to manufacturing. The same author makes the point that in order to prevent this income disparity from

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[1] This 'transfer problem' of agricultural labour out-migration was documented several years ago by Shultz (1964) and Johnson (1951) among others. For a more recent assessment see Mundlak (2000), Timmer (1988), Williamson (1988), and Dennis and Iscan (2007).

culminating in serious social and political instability, policies have been reoriented toward supporting the income of farmers.

On the other hand, evidence has been presented regarding China (see Yang and Zhou, 1999; Yang, 1999) with reports of how urban-bias in government policy has been a fundamental determinant of the increase in rural-urban income disparity. Interestingly, these authors have shown that during the economic reforms of the 1970s, China substituted government constraints on rural-urban migration with urban-biased policies. These policies contributed substantially to the increase of income inequality in China during the 1980s and 1990s.[2]

These stylised facts, associated with policies that traditionally tax farmers in low-income countries and support them in developed countries, make it difficult to use *observed* sectoral incomes to document the non-monotonic relationship between relative agricultural income gap and economic development.

This contribution has two aims. Firstly, we analyse patterns of inter-sectoral agricultural labour migration as well as patterns of sectoral productivity growth and agricultural relative income gap, across both countries and EU regions. Secondly, we test empirically whether or not the supposed U-shaped relationship between the relative agricultural productivity gap and the level of development represents a robust regularity, taking into consideration the role played by agricultural policy.

This paper is organised as follows. In section 2, data and variables used to estimate off-farm labour migration at both international and EU regional level, and data on sectoral productivities and agricultural policy, are presented. Section 3 deals with the analysis of the patterns of off-farm migration and productivity growth. In section 4 we perform an econometric test to see whether the relationship between the agricultural productivity gap and development is robust to different specifications, country sample, and controlling for agricultural policy. Finally, section 5 discusses the main implications and draws some conclusions.

2. Data and variables

To study the patterns of off-farm labour migration[3] and the relationship between relative agricultural income gap[4] and economic development, data was collected at both international and EU regional level. The data set assembled by McMillan and Rodrik (2011) was used for international comparison with sectoral data on employment, value added, and labour productivity for 38 countries over the period 1990-2005 (annual data). The original dataset is based on data taken from the Groningen Growth and Development Centre (GGDC) integrated with 11 countries (9 African countries plus China and Turkey). The GGDC database has two sections: the 10-sector database (Timmer and de Vries, 2007) and the EU-KLEM database (Timmer et al., 2007).

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[2] Data on inequality decomposition in Chinese provinces indicates that rural-urban income differentials constitute a large share of total inequality, and the widening sectoral gaps from 1985 to 1995 have caused rising inequality in China. Yang (1999) shows that the rise in sectoral disparity is due to increased urban-bias policies such as subsidies, investments, and credits, which have resulted in higher rates of inflation on rural earnings.

[3] Using agricultural employment information from country (region) datasets, the off-farm migration rate was computed according to the following equation: $m_{kt}=(Aw_{k(t-1)}- Aw_{kt})/Aw_{k(t-1),}$ where Aw_{kt} refers to 'Agricultural workers' in the country (region) *k* at the time *t*. This type of computation has positive values in the presence of off-farm migration and negative values with the migration of workers into agricultural sectors from other sectors.

[4] The income gaps between the agricultural and non-agricultural parts of the economy were computed by dividing agricultural by non-agricultural labour productivity. Therefore, a low ratio indicates huge differences in productivity between agricultural and other economic sectors (high productivity gap), and vice versa. Agricultural and non-agricultural productivity was computed by dividing the sectoral value added by the corresponding level of employment.

The 10-sector database provides sector-level information on employment and value added for 19 countries (10 Asian and 9 Latin American) over the period 1950-2005. The EU-KLEM database has been built with the same methodology and time coverage to integrate the 10-sector database with data on 8 OECD countries (7 European countries plus the USA). To take advantage of a wider number of observations, the dataset of McMillan and Rodrik was added to the observations of the 10-sector database and the EU-KLEM Database before 1990. Table A.1 in the Appendix reports country and time coverage of the pooled dataset used in the analysis presented in this paper.

The international dataset is complemented with data of the agricultural nominal rate of assistance (*NRA*) from the World Bank "Agdistortions Database" (see Anderson and Valenzuela, 2008). The *NRA* is calculated as $= \frac{(P-P^1)}{P^1}$, where P is the actual domestic price in local currency and P^1 is the estimated domestic price that would hold in the absence of any commodity-market or exchange-rate intervention. Consequently, the *NRA* is like an equivalent tariff measuring the total transfer to agricultural products (sector) as a percentage of the undistorted unit values. The *NRA* is positive when the product is subsidised, negative when it is taxed, and 0 when net transfers are zero.

At EU regional level the data for the analysis of out-farm migration within the EU covers 154 regions of the 15 'old' European Union countries[5] and 56 regions of the 12 new member states throughout the period 1990-2010.[6] Table A.2 in the Appendix describes the number of regions used for each country according to the Nomenclature of Statistical Units (NUTS) and distinguishing between the NUTS1 and NUTS2. The decision to use both NUTS1 and NUTS2 is motivated by the need to link data from different sources. Indeed, the "Farm Accountancy Data Network" (FADN) regional classification that was used to retrieve data about agricultural subsidies from the CAP does not always match the NUTS2 level defined by Eurostat.

The EU regional data are taken from the Cambridge Econometric's Regional Database, which represents an improvement and rationalisation of the 'Eurostat Regio' series. Specifically, data on total and agricultural gross value added and sectoral employment was collected from this source to measure both off-farm migration and relative agricultural income gap. Labour productivity is calculated as Gross Value Added (GVA) per worker at constant and basic prices. The difference between total GVA and GVA in agriculture, also for non-agricultural employment, was used for the non-agriculture sector.

Concerning the measurement of CAP payments at the EU regional level, the FADN data was exploited in accordance with Olper et al. (2012). Specifically, the amount of payments received by the 'average farm' in each year over the period 1990-2010 in every region covered by the FADN was obtained. The extent to which the average farm is representative of the farm population,[7] then the computation of the ratio between this farm CAP payments and the respective farm net income (including subsidies) means it is possible to measure a consistent regional level of farm protection due to different CAP policy measures. Note that in addition to only being based on farm subsidies, this indicator of agricultural protection measured at regional level is conceptually different from the *NRA* used to estimate agricultural protection in the international dataset. However, this is the only source of data from which it is possible to measure the level of farm subsidies at regional level consistently.

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[5] Luxembourg is coded as a NUTS1 (and NUTS2) single region. Information could not be found for the four French overseas departments, the two Portuguese regions of Madeira and Azores, the two Greek regions of Voreio Aigaio and Notio Aigaio, and the Åland region in Finland due to lack of data.

[6] Cyprus, Estonia, Lithuania, Latvia, and Malta are coded as NUTS1 (and NUTS2) single regions.

[7] For each region, the FADN sample is stratified according to the Type of Farming (TF) and the Economic Size Unit (ESU) class, while the same stratification is made on the regional farm population. Each stratum in the sample is then weighted to render its data representative of the underlying population. This procedure makes the FADN data representative at the regional level for TF and ESU and, indirectly, for Pillar I payments, while this is not the case for Pillar II payments.

3. Patterns of off-farm labour migration, productivity, and income gap

3.1 Off-farm migration

Tables 1 and 2 report the mean value of off-farm migration rate, agricultural labour productivity, relative income gap, and agricultural productivity growth for the 38 countries and 209 European regions, respectively. Moreover, in order to understand the off-farm migration rate over time more clearly, Figures 1 and 2 plot migration values for each country (region). In the figure, the average migration rates of the two subsequent decades are reported on the y and x axis, respectively. As the farm migration can range from negative to positive values, each graph is divided into four quadrants.

Table 1. Migration rate and agricultural labour productivity at country group level (mean value for each decade)

		N. Obs	Migration rate (%)	Agricultural labour productivity (US$)	Productivity Gap	Agricultural Productivity Growth (%)
9 African countries	1990-2000	83	-1.361	3,852	0.28	1.22
	2000-2010	65	-0.743	6,221	0.35	2.67
10 Asian countries + Turkey	1960-1970	30	-0.353	2,164	0.29	3.71
	1970-1980	74	-0.494	5,130	0.34	2.59
	1980-1990	91	1.143	7,980	0.39	2.64
	1990-2000	109	1.850	8,992	0.35	2.01
	2000-2010	72	0.031	10,040	0.32	2.97
9 High-income countries	1950-1960	56	2.163	5,146	0.25	4.57
	1960-1970	89	4.070	8,231	0.32	5.79
	1970-1980	90	2.536	13,252	0.39	4.33
	1980-1990	90	2.584	20,784	0.53	5.23
	1990-2000	90	2.424	32,298	0.71	3.91
	2000-2010	54	2.002	41,830	0.83	2.32
9 Latin American countries	1950-1960	72	-0.606	3,237	0.19	2.43
	1960-1970	89	-0.464	4,087	0.19	2.84
	1970-1980	90	-0.325	5,452	0.23	2.67
	1980-1990	90	-1.667	6,490	0.30	0.90
	1990-2000	90	0.101	8,241	0.39	3.29
	2000-2010	54	-0.361	10,654	0.51	2.65

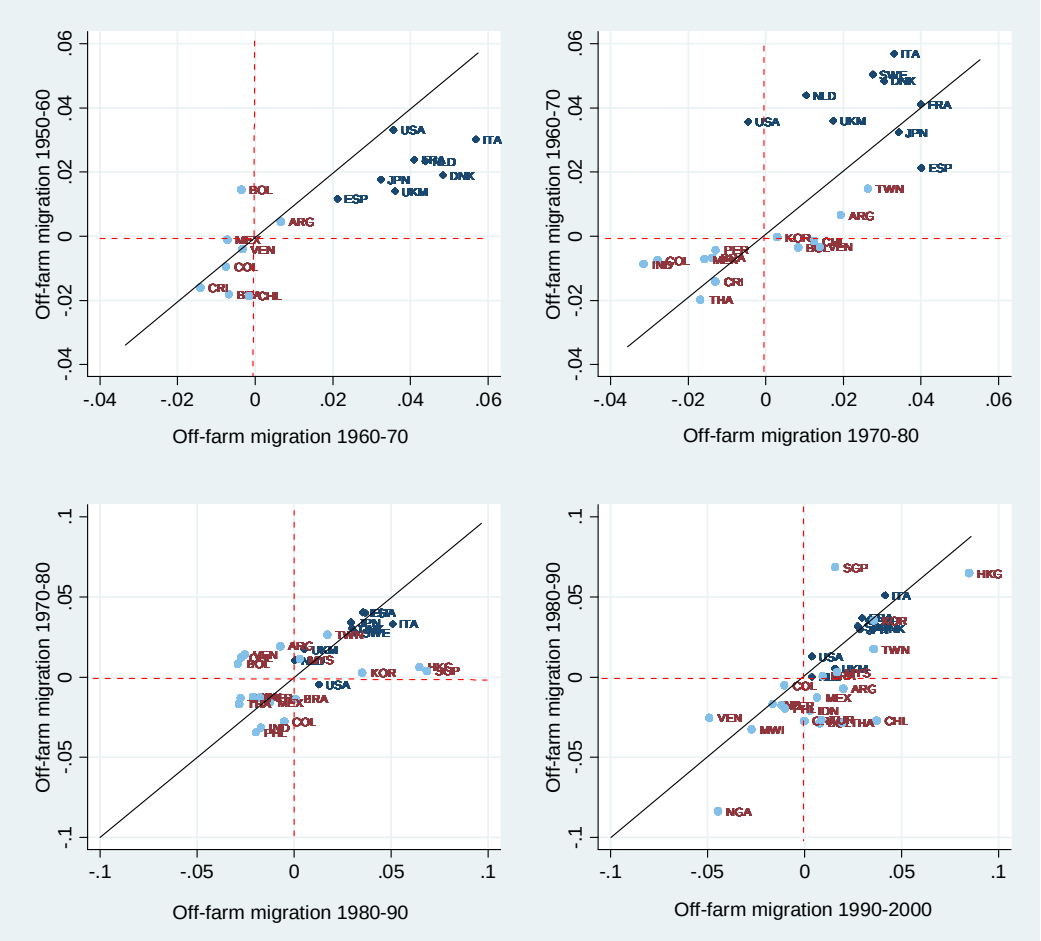
Source: our estimates from McMillan and Rodrik database (see text).

Table 2. Migration rate and agricultural labour productivity at European regional level (mean value for each decade)

	N. Obs	Migration rate (%)	Agricultural labour productivity (Euros)	Productivity Gap	Agricultural Productivity Growth (%)
1990-2000	2310	2.53	32,381	0.54	4.47
2000-2010	2100	1.71	37,533	0.65	2.39
EU15 regions					
1990-2000	1694	2.68	41,184	0.56	5.06
2000-2010	1540	1.18	46,946	0.64	1.35
12NMSs regions					
1990-2000	616	2.11	8,245	0.49	2.84
2000-2010	560	3.15	11,649	0.69	5.25

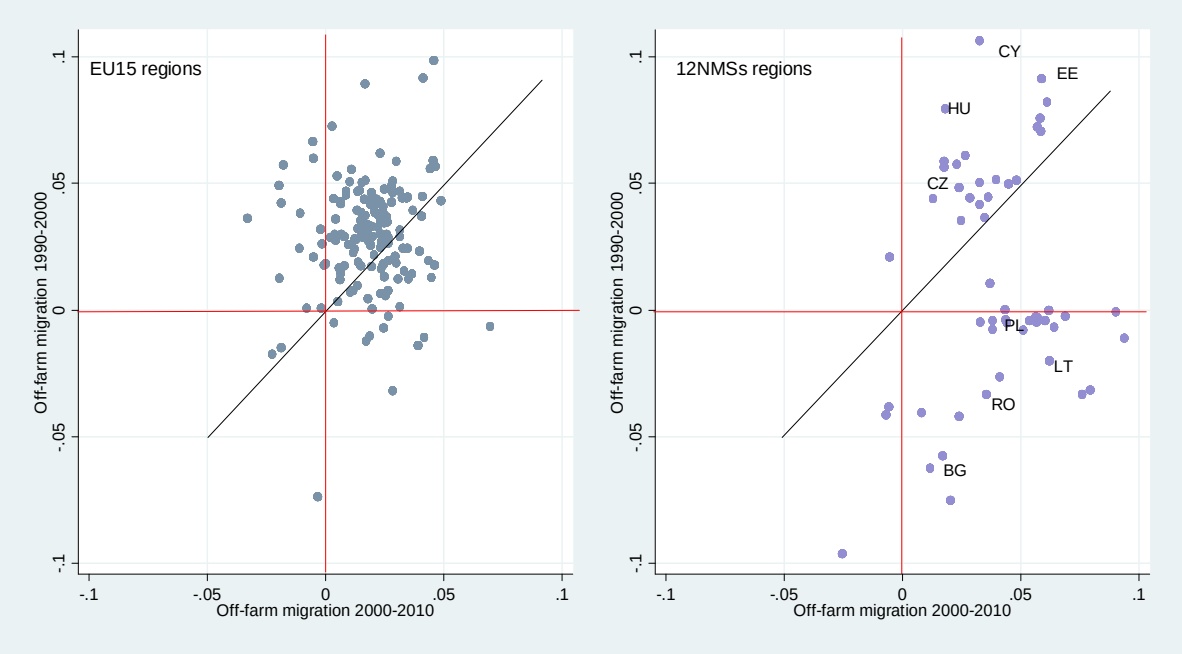
Source: our estimates based on Cambridge Econometric Regional Database (see text).

Figure 1. Global off-farm migration rates during decades (1950s to 2000s)



Source: our estimates based on McMillan and Rodrik database (see text).

Figure 2. Off-farm migration rates in EU regions during the 1990s and 2000s



Source: our estimates based on Cambridge Econometric Regional Database.

Starting from the international country data set (see Figure 1), high-income countries (OECD), which are symbolised in the graph by a square, always fall in the first quadrant and are characterised by a positive migration rate in both decades. In particular, all of these countries show average migration increasing during the 1960s (first graph) from 2.2% to 4%, but in contrast, they experience a general reduction of migration rates during the 1970s (second graph) as highlighted by the observations above the diagonal line. Exceptions are France and Japan maintaining the same migration rate in this period, and Spain where migration continued to increase. From the 1970s to the 1990s the high-income countries had an evident and persistent off-farm migration rate as seen in their position very close to the diagonal line and by the average migration value permanently close to 2.5% (see Table 1, third and fourth quadrant). The behaviour of low-income countries is very different and symbolised on the graph by circles, which generally fill the third quadrant (negative migration in both periods), and that present an inflow of labour into the agricultural sector from 1950 to 1990. By contrast, the 2000s saw a marked acceleration in the off-farm migration rate in these countries, which has become a pervasive feature for most of them, showing a reversal of the trend.

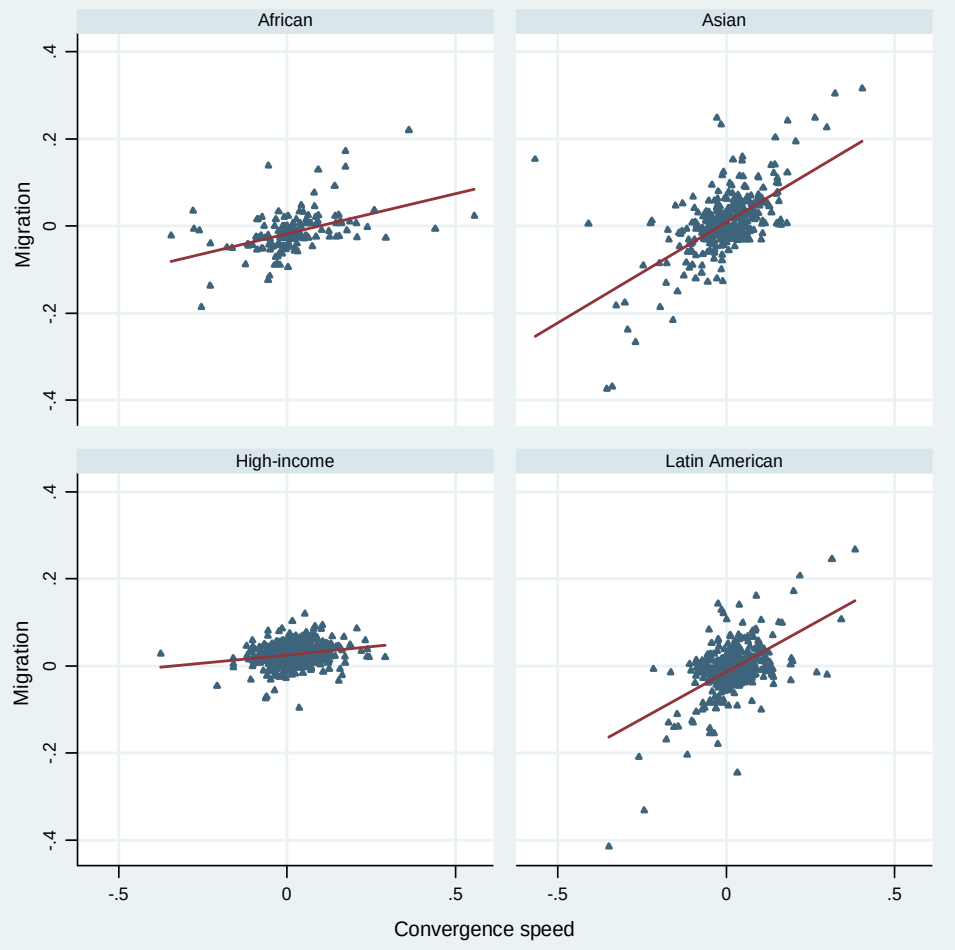
Examining the 27 EU regions, the out-farm migration rate presents a slight decrease over the last two decades (1990s and 2000s), passing from 2.53% to 1.71%. However, when the EU15 regions are considered separately, there is a bigger drop in the average migration rate from 2.68% to 1.18% (see Table 2). The individual region performance shows that most of the EU15 regions have a migration rate that slows down between decades, as highlighted in Figure 2 by the observations above the diagonal line. Only a few regions had a different pattern, with migration increasing (especially in Spain and Belgium) or migration being reversed (in some UK regions). By contrast, regions in NMS show a strong average increase of migration rate through the two decades from 2.11% to 3.15%, but with two different behaviours. One group of regions (Estonia, Cyprus, Hungary, and the Czech Republic) presents a decrease in off-farm migration, while in the other group of regions, especially Romania, Bulgaria, Poland, and Lithuania off-farm migration reversed, passing from negative value in the 1990s, to high positive values in the 2000s.

3.2 Productivity and migration

The choice to migrate from the agricultural sector is influenced by incentives such as sectoral income. Consequently, the larger the income gap between sectors, the stronger the migration rate (Mundlak, 2000), *ceteris paribus*. At the same time, when labour moves from less to more productive activities, the economy grows even if there is no growth in productivity within sectors. Note moreover that, when off-farm migration contributes to an increase in agricultural labour productivity and this increase is greater than the non-agricultural productivity growth, agricultural relative income brings about convergence in sectoral incomes. This positive relationship between migration and the speed of convergence is shown in Figure 3 (Figure 4) where these variables are plotted at country (regional) level.[8] Although this pattern is apparent in all country groups, the value of the average productivity gap over the decades highlights deep differences in the speed of convergence between agricultural versus non-agricultural income (see Tables 1-2). In particular, in developed countries, where the migration rate has always been above 2%, agricultural productivity growth over the last 60 years filled the large gap in labour productivity between the traditional and modern part of the economy, with the highest productivity difference being in Japan and the lowest in the UK. Conversely, the process of reduction in the gap between sectoral productivity presents a different speed in developing countries, where the possibility that displaced workers could finish in even lower-productivity activities cannot be ruled out (McMillan and Rodrik, 2011). This convergence process is more evident in Latin American countries, despite the negative value of the average migration, where the labour force seems to have moved from high to low-productivity activities. In contrast, the relative income gap in the Asian countries changes slightly and the agricultural labour productivity has continuously remained at one third that of the non-agricultural sector over the last 50 years.

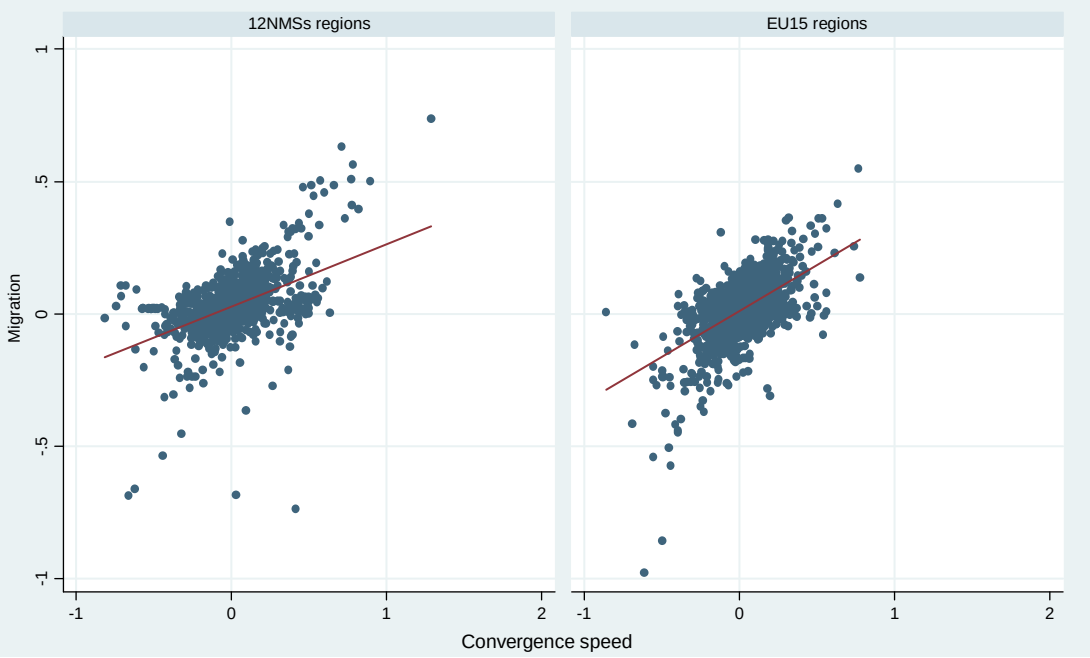
[8] Convergence speed is computed as the relative agricultural income gap growth.

Figure 3. Relationship between migration and labour productivity convergence speed in world countries



Source: our estimates based on the McMillan and Rodrik database (see text).

Figure 4. Relationship between migration and labour productivity convergence speed in European regions



Source: our estimates based on Cambridge Econometric Regional Database (see text).

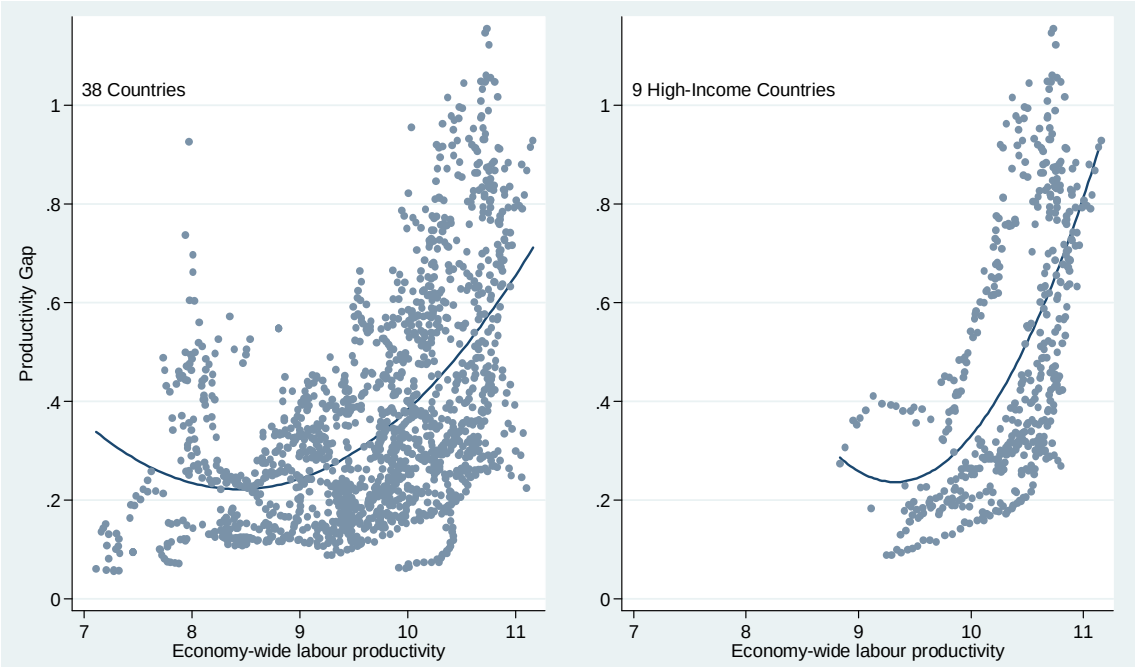
It is easier to see what has happened at European regional level where the dynamic reproduces what has already been described for high-income countries in the last two decades. The exception are regions in new member states, where average off-farm migration and agricultural productivity markedly increased over the last decade, reducing the differentials in productivities despite the big differences in labour productivity levels. Indeed, the agricultural labour productivity of European regions during the 2000s ranged from the minimum of the Bulgarian region of Severozapaden with a productivity of €2,072 to the maximum of the Dutch region of 'Groningen' where labour productivity is over €90,000, almost 45 times greater (see Table A.4 in the Appendix).

4. Agricultural productivity gap and economic development

Whether or not there is a U-shaped relationship between the relative agricultural income gap and development at both international and EU regional level is now empirically tested. The economic logic behind this U-shaped relationship is that if economic growth occurs, the modern and 'urban' sectors of the economy expand and the gap between them and the traditional agricultural sectors begins to widen. Therefore, up to a certain point labour begins to move from traditional agriculture to the modern part of the economy. Beyond this point, productivity levels begin to converge within the economy and productivity diffuses throughout the rest of the economy, thereby reducing the productivity gap.

Figure 5 shows the relationship between the country level of development, measured as the (log) of economy-wide labour productivity, and the ratio of agricultural to non-agricultural productivity with reference to all of the 38 countries and to a sub-sample of the 9 high-income countries. As highlighted in Figure 5, the quadratic curve with its U-shaped pattern fits the data very well, the turning point being at an economy-wide productivity level of around $7.259 (=exp(8.8)) per worker. This value corresponds to the development level of China and India in the 2000s or Thailand in the mid-1980s, and represents the kind of turning point that most of the African countries included in the dataset are still waiting for. By contrast, all the high-income country economies show labour productivity levels that started their convergence process between agricultural and non-agricultural sectors many years ago.

Figure 5. Relationship between economy development level and productivity gap



Note: the line refers to the fitted value.

Source: estimates based on the McMillan and Rodrik database (see text).

Is this relationship a robust pattern of development, or it is just a result of spurious correlation? Answering this question is particularly important because, as discussed by Hayami (2007), the turning point of the relationship often coincides with a marked change in agricultural policy patterns, moving from taxation to subsidisation of the agricultural sector. If this is the case, then clearly problems emerge in empirically testing the relationship because of the role played by agricultural policies. Indeed, because these subsidies or taxes are sometimes very large, these policy transfers can clearly affect the measurement of the agricultural relative income gap. Specifically, with transfers going from the agricultural to the non-agricultural sectors in poor countries (and vice versa in rich countries), the pre-transfer rural-urban income ratio will be lower (higher) than that observed in poor (rich) countries. In medium-income countries, the transfers are comparatively low and so the observed income ratio is closer to the pre-transfer ratio.

Consequently, the most important issue in testing the relationship between the agricultural relative income gap and the level of development is the need to control for the large transfers induced by agricultural policies. However, as clearly shown by Hayami (2007) and the large body of literature on the political economy of agricultural protection, the policy itself is affected by the agricultural rural income gap (see Swinnen, 1994). This raises issues about the endogeneity of the policy transfer to the agricultural income gap.

So it is important to bear in mind that the inclusion of the agricultural policy variable in the empirical estimation below cannot be interpreted as the effect of policy on the sectoral income gap. In fact, it is included in order to estimate the 'true' relationship between pre-transfer or pre-tax agricultural income gap and development. Put differently, our main objective is to test if after controlling for the agricultural policy transfer and tax and other unobserved factors, the U-shaped relationship continues to hold and if so, how it changes with respect to a specification where we do not control for agricultural policy. In fact, the particular direction of the changes can offer new insight into the effect of agricultural policy on the process of convergence in sectoral productivity.

4.1 Empirical evidence

In order to verify the robustness of these relationships, the productivity gap is regressed on the economy-wide labour productivity and country-fixed effects to control for any other omitted factors. The results of this exercise are reported in column 1 of Table 3.

Table 3. Relationship between agricultural relative productivity gap and economic development at the international level

Dependent variable: Productivity gap										
	All Countries		African		Asian		High income		Latin American	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(labour productivity)	-3.33***	-3.29***	-1.71***	-1.97***	-0.93***	-0.76***	-11.17***	-10.78***	-4.36***	-4.68***
	(0.16)	(0.15)	(0.54)	(0.54)	(0.15)	(0.15)	(0.58)	(0.58)	(0.85)	(0.83)
Log(labour productivity)sq	0.18***	0.18***	0.10***	0.11***	0.05***	0.04***	0.57***	0.55***	0.25***	0.27***
	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.01)	(0.03)	(0.03)	(0.04)	(0.04)
NRA		-0.06***		0.10*		0.11***		-0.09***		0.25***
		(0.02)		(0.06)		(0.01)		(0.02)		(0.04)
Constant	14.93***	14.68***	7.63***	8.81***	4.38***	4.09***	55.12***	53.09***	18.86***	20.51***
	(0.72)	(0.70)	(2.46)	(2.48)	(0.70)	(0.68)	(2.94)	(2.96)	(4.04)	(3.89)
No.of Obs.	1030	1030	126	126	301	301	398	398	205	205
R-Sq	0.74	0.74	0.79	0.80	0.85	0.88	0.81	0.81	0.73	0.76
Turning point [= exp (a/2b]	10,405	9,310	5,167	7,743	10,938	13,360	18,002	18,034	6,124	5,806

Notes: country-fixed effects included in each regression. Robust standard errors in parentheses.
*, ** and *** indicate statistically significant at 10%, 5%, and 1% level, respectively.

The estimated coefficients of the linear productivity level and its square are negatively and positively related to the income gap, respectively, and both are very significant. Therefore, results strongly point toward the existence of a U-shaped relationship between the productivity gap and the development level. The relationship estimated shows that agricultural relative income is negatively related to the level of the wide-economy labour productivity until it reaches a level of $10,405. This level represents the turning point of the relationship.[9] A process of convergence in sectoral productivity starts after this point, with a rapid increase in the agricultural relative income gap. Moreover, note that given the inclusion of country-fixed effects in the specification, the results suggest that the relationship between agricultural income gap and economic development holds true within countries.

Column (2) adds the level of protection to the relationship, which is measured as *NRA*. Its estimated coefficient is significant, and negative confirming that agricultural policy affects relative income. However, what is important is that the U-shaped relationship is only marginally affected. Due to endogeneity issues discussed above, it does not make much sense to give a structural interpretation to the *NRA* coefficient. However, it should be noted that the inclusion of *NRA* purges the income gap-development relationship from the effect of policy. Therefore, by comparing the change in the turning point on passing from regression (1) to regression (2), the extent to which agricultural policies have accelerated or retarded the process of convergence in relative productivity can be evaluated. Controlling for policy, the turning point of the relationship falls slightly to $9.310. A literal interpretation of this result would be that agricultural policy has slightly retarded the process of convergence in productivity level between agricultural and non-agricultural sectors in the overall sample, *ceteris paribus*.

Columns (3), (5), (7), and (9) of Table 3 test the relationship by respectively considering the sub-sample of African, Asian, high income, and Latin American countries. The relationship is very robust for all the country groups considered. Unsurprisingly, the turning point of the relationship is very sensitive to the level of development, tending to increase on moving from poor African countries ($5,167) to Latin American countries ($6,124) and Asian countries ($10,938), to high income countries ($18,002). Controlling for policy as in columns (4), (6), (8), and (10), the estimated turning point moves to the right for African and Asian countries, but slightly to the left for Latin American ones, and remains the same for high-income countries. Therefore, the effect of taxation and/or subsidisation of the agricultural sector do not display a clear pattern. There is some evidence that agricultural policy in African and Asian countries worked in favour of the process of convergence in relative income as the process of labour adjustment was probably accelerated. However, this effect is less apparent for the high-income country group, and appears to have had the opposite effect in Latin American countries.

Table 4 reports the results of estimating the income gap development relationship for the EU regions (columns 1 and 2), with the old EU15 regions (columns 3 and 4) and the 12NMS regions (columns 5 and 6) being considered separately. Results at the EU regional level are impressively similar to those obtained across countries; once again confirming that the relationship between the dynamic of the relative income gap and economic development represents an important and robust regularity in the development process. Within the EU regions, controlling for policy induces a relevant shift of the turning point to the right, from €9.094 to €15.783, an effect largely driven by the EU15 regions (compare results in columns 3 and 4). This is not surprising as the agricultural subsidies for the NMS regions are of several orders of magnitude lower than in the EU15 regions, and appeared only in the second part of the period considered here. Note that after controlling for agricultural policy transfers, the shifting of the turning point in the EU15 regions is consistent with the idea that government policies have accelerated the process of convergence in relative productivity.

[9] The estimated turning point is a little higher than that obtained from Figure 5, simply because country-fixed effects are always controlled for in the specifications of Table 3.

Table 4. Relationship between agricultural relative productivity gap and economic development at the EU regional level

Dependent variable: Productivity gap						
	All EU regions		EU15 regions		12NMSs regions	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(economy-wide labour productivity)	-2.37***	-2.32***	-3.26***	-3.17***	-2.09***	-1.95***
	(0.62)	(0.62)	(0.82)	(0.82)	(0.29)	(0.27)
Log(economy-wide labour productivity)sq	0.13***	0.12***	0.17***	0.16***	0.14***	0.13***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.02)	(0.02)
Total payments		0.03***		0.04***		0.05***
		(0.01)		(0.01)		(0.01)
Constant	11.47***	11.29***	15.88***	15.56***	8.11***	7.61***
	(3.24)	(3.23)	(4.36)	(4.34)	(1.21)	(1.14)
No.of Obs.	2943	2943	2706	2706	1176	1176
R-Sq	0.84	0.85	0.81	0.81	0.65	0.65
Turning point [= exp (a/2b]	9,094	15,783	14,592	20,055	1,745	1,808

Notes: Columns (1) to (4) only include observations with existing 'Total payments' values; columns (5) and (6) include all NMS observations, replacing not reported payment with zero value in the years before accession. Country-fixed effects are included in each regression. Robust standard errors in parentheses. *, ** and *** indicate statistically significant at 10%, 5%, and 1% level, respectively.

5. Conclusions

This paper reviews the key mechanisms that affect the process of off-farm labour reallocation during the process of economic development and its relationship with the evolution of the relative income gap. The variation in off-farm migration obtained from two different data sets was analysed, one relating to 38 countries from all continents, the other relating to EU regions. This data was used to study the patterns of off-farm migration in the last 50 years. The analysis has documented interesting and robust correlations between the rate of labour reallocation, convergence in the relative income gap, and economic development.

Firstly, it was found that there is a strong positive correlation between the rate of off-farm migration and the convergence process in across-sector per capita productivity growth. Secondly, whether or not the supposed U-shaped relationship between relative income gap and economic development is a robust stylised fact was empirically tested. Strong support for this relationship was found across both samples and also within countries and regions. Third, the role played by agricultural policy was also highlighted, giving broad confirmation to the idea that the pattern of taxation and subsidisation of agriculture policy affects, and is affected by, the turning point of the relationship. Starting from the robust stylised facts established in this paper, future research needs to analyse how the fixed labour relocation costs or other potential mechanisms are responsible for the long-term trend in the observed agricultural income gap.

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Appendix

Table A.1 Number of countries and time coverage of the dataset

Groups of countries	*N. countries*	*Time coverage*	*Database*
Asia	9	1950-2005	GGDC - 10 sector
Latin America	9	1950-2005	GGDC - 10 sector
High Income	9	1950-2005	GGDC - Eu-Klem
Africa + 2 Asia (China +Turkey)	11	1990-2005	McMillan and Rodrik
TOTAL	**38**		

Table A.2 Sample of European country regions considered

EU15 Countries	**NUTS**	**Number of regions**	**12 NMSs Countries**	**NUTS**	**Number of regions**
Belgium	(2)	10	Latvia	(1)	1
Denmark	(2)	5	Lithuania	(1)	1
Greece	(2)	11	Estonia	(1)	1
France	(2)	22	Malta	(1)	1
Germany	(1)	14	Cyprus	(1)	1
Ireland	(2)	2	Bulgaria	(2)	6
Italy	(2)	21	Czech Republic	(2)	8
Luxembourg	(2)	1	Hungary	(2)	7
The Nederland	(2)	12	Poland	(2)	16
Austria	(2)	9	Romania	(2)	8
Portogal	(2)	5	Slovenia	(2)	2
Finland	(2)	4	Slovakia	(2)	4
Sweden	(2)	8			
Spain	(2)	17			
United Kingdom	(1)	12			
EU15 regions		153	NMSs regions		56

Table A.3 Agricultural Labour productivity: summary statistics (USD)

		Agricultural labour productivity				
		Mean	Min		Max	
9 African countries	1980-1990	nd				
	1990-2000	3,852	355	Malawi	22,198	Mauritius
	2000-2010	6,221	521	Malawi	25,878	Mauritius
10 Asian countries + Turkey	1960-1970	2,164	1,102	Thailand	3,866	Korea
	1970-1980	5,130	1,526	Thailand	21,733	Honk Kong
	1980-1990	7,980	1,735	India	25,729	Honk Kong
	1990-2000	8,992	1,311	China	29,285	Honk Kong
	2000-2010	10,040	1,943	China	24,639	Singapore
9 High-income countries	1950-1960	5,146	1,627	Italy	13,364	United States
	1960-1970	8,231	2,685	Italy	19,334	United States
	1970-1980	13,252	5,545	Spain	24,067	United Kingdom
	1980-1990	20,784	8,667	Japan	36,946	United States
	1990-2000	32,298	12,818	Japan	49,300	United States
	2000-2010	41,830	13,308	Japan	65,306	United States
9 Latin American countries	1950-1960	3,237	1,021	Brazil	7,424	Argentina
	1960-1970	4,087	1,326	Brazil	10,242	Argentina
	1970-1980	5,452	1,674	Brazil	14,299	Argentina
	1980-1990	6,490	2,247	Bolivia	14,617	Argentina
	1990-2000	8,241	2,362	Bolivia	23,023	Argentina
	2000-2010	10,654	3,424	Bolivia	28,003	Argentina

Source: estimates based on McMillan and Rodrik database.

Table A.4 Agricultural labour productivity in European regions (Euro)

	Agricultural labour productivity				
	Mean	**Min**		**Max**	
1990-2000	32,381	138	Latvia	74,331	Luxenbourg
2000-2010	37,533	2,072	Severozapaden (BG)	92,049	Groningen (NL)
EU15 regions					
1990-2000	41,184	9,852	Centro (PT)	74,331	Luxembourg
2000-2010	46,946	16,777	Centro (PT)	92,049	Groningen (NL)
12NMSs regions					
1990-2000	8,245	138	Latvia	29,613	Cyprus
2000-2010	11,649	2,072	Severozapaden (BG)	31,327	Cyprus

Source: estimates based on Cambridge Econometric Regional Database.

Comparative Analysis of Factor Markets for Agriculture across the Member States

245123-FP7-KBBE-2009-3

The Factor Markets project in a nutshell

Title	Comparative Analysis of Factor Markets for Agriculture across the Member States
Funding scheme	Collaborative Project (CP) / Small or medium scale focused research project
Coordinator	CEPS, Prof. Johan F.M. Swinnen
Duration	01/09/2010 – 31/08/2013 (36 months)
Short description	Well functioning factor markets are a crucial condition for the competitiveness and growth of agriculture and for rural development. At the same time, the functioning of the factor markets themselves are influenced by changes in agriculture and the rural economy, and in EU policies. Member state regulations and institutions affecting land, labour, and capital markets may cause important heterogeneity in the factor markets, which may have important effects on the functioning of the factor markets and on the interactions between factor markets and EU policies. The general objective of the FACTOR MARKETS project is to analyse the functioning of factor markets for agriculture in the EU-27, including the Candidate Countries. The FACTOR MARKETS project will compare the different markets, their institutional framework and their impact on agricultural development and structural change, as well as their impact on rural economies, for the Member States, Candidate Countries and the EU as a whole. The FACTOR MARKETS project will focus on capital, labour and land markets. The results of this study will contribute to a better understanding of the fundamental economic factors affecting EU agriculture, thus allowing better targeting of policies to improve the competitiveness of the sector.
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Website	www.factormarkets.eu
Partners	17 (13 countries)
EU funding	1,979,023 €
EC Scientific officer	Dr. Hans-Jörg Lutzeyer